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ABSTRACT

Emerging research findings demonstrate a relationship between learning styles and approaches to using the World Wide Web and other hypermedia, especially in terms of success with information retrieval. One of the most widely used conceptions of learning styles is Witkin's Field Dependence (FD)/Field Independence (FI). FI individuals perceive details and rely on internal cues, whereas FD individuals use their entire surroundings, including other people, to process information. Although most research findings show that FI's perform more efficient searches in less time and are more comfortable with "surfing" in hyperspace, FD's can use hypermedia as efficiently as FI's can, provided their learning style preferences are accommodated. Accommodations include providing a site guide or a global overview (for example, menus listing all possible choices). Other variables affecting information-seeking processes include the following: motivation; perceived importance or value of information; prior computer experience or subject knowledge; degree of self-direction; and knowledge of interface. The key is to recognize the implications of one's preferred learning style, know how to select and use hypermedia tools to match one's style, and learn to create mental models and use metacognitive strategies. (Includes an annotated bibliography of 22 print and hypertext publications, which comprises more than half of the document.)) (MN)

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Learning Styles and Electronic Information Trends and Issues Alerts

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TRENDS AND ISSUES ALERTS
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Learning Styles and Electronic Information

It has been said that the World Wide Web and other hypermedia-based systems are modeled on the way the brain processes information (Ayersman 1993; Kussrow 1997; Small and Ferreira 1994). Individuals process information by using distinctive patterns known as learning styles to select, organize, and store it. Emerging research findings demonstrate a relationship between learning styles and approaches to using hypermedia, especially in terms of success with information retrieval. This *Alert* highlights some of these findings and provides an annotated list of resources so that adult educators can help learners make the best use of electronic information.

Among the most widely used conceptions of learning styles is Witkin's Field Dependence (FD)/Field Independence (FI). Much of the hypermedia research compares FI individuals, who perceive details and rely on internal cues, with FDs, who use their entire surroundings—including other people—to process information. Although hypermedia integrate aural, visual, and textual elements that accommodate various learning styles, most findings (Chou and Lin 1997; Cline 1991; Hsu et al. 1991; Kim 1997; Leader and Klein 1994) show that FIs perform more efficient searches in shorter time and are more comfortable jumping around ("surfing") in hyperspace. FDs more often report feeling disoriented or lost, navigate more linearly (frequently using Back or Home keys), and tend to follow sequences instead of jumping around, accepting the environment as presented. This may be because FIs use active approaches such as hypothesis testing; form mental models of how the Internet is constructed and information is organized, revising them continuously; use metacognitive strategies (planning, monitoring, reflecting, regulating); and transfer concepts and search methods to new situations. FDs prefer to be guided and want a global overview, such as explicit menus listing all possible choices (Chou and Lin 1997). Liu and Reed (1994) found that both FIs and FDs perform well, but approach the task differently.

Other variables affect information-seeking processes: motivation, perceived importance or value of information, self-efficacy, problem-focused or emotion-focused problem-solving styles, prior computer experience or subject knowledge, degree of self-direction, and design of the interface (Grabowski and Curtis 1991; Hsu et al. 1994; Kim 1997; Small and Ferreira 1994). In addition, the use of hypermedia itself can influence the development of different strategies or approaches (Chou and Lin 1997).

Cline (1991) envisions a day (perhaps not far off) when we will carry cards coded with learning style information and individual profiles that we will plug into a machine, which will adapt itself to our preferred style. Until that happens, educators helping adults learn to be lifelong information seekers (as well as designers of hypermedia systems) should bear in mind that the average user learns only what is needed to perform a task (ibid.). "A rich array of support is possible within the information landscape" (Hillinger 1994, p. 37). The key is to recognize the implications of one's preferred learning style; know how to select and use hypermedia tools such as indexes and site maps that match one's style; and develop the ability to create mental models and use metacognitive strategies.

Resources

Ayersman, D.J. "An Overview of the Research on Learning Styles and Hypermedia Environments." Paper presented at the annual convention of the Eastern Educational Research Association, Clearwater, FL, February 1993. (ED 356 756)
Provides a conceptual foundation for the development of hypermedia as a tool for addressing learning style differences. Examines information processing theory, semantic networks, concept webbing/mapping, frames/scripting, and schema theory.

Buckley, J. "Multimedia Instruction: One Solution to the Development of Diverse Learning Environments." In *Theories of Learning. Selected Papers from the 4th Annual Conference of the Institute for the Study of Postsecondary Pedagogy*, edited by R. Kelder, pp. 69-76. New Paltz: State University of New York, 1994. (ED 394 408)
Discusses the implications of Hanson, Silver, and Strong's typology of learning styles (sensing feelers, intuitive feelers, sensing thinkers, intuitive thinkers) for the development of multimedia.

Cahoon, B. "Teaching and Learning Internet Skills." *New Directions for Adult and Continuing Education* no. 78 (Summer 1998): 5-13.
Presents a cognitive view of how adults learn to use the Internet and describes a practice-oriented approach to teaching basic Internet skills.

Choo, C.W.; Detlor, B.; and Turnbull, D. "A Behavioral Model of Information Seeking on the Web." Paper prepared for the annual meeting of the American Society for Information Science, Pittsburgh, PA, October 1998. <choo.fis.utoronto.ca/fis/respub/asis98/default.html>
A study of how managers and information technology specialists use the Web to find work-related information was used to develop a behavioral model that relates motivations (strategies and modes of searching) and moves (tactics used to find information).

Chou, C., and Lin, H. "Navigation Maps in a Computer-Networked Hypertext Learning System." Paper presented at the Annual Meeting of the Association for Educational Communications and Technology, Albuquerque, NM, February 12-16, 1997. (ED 403 882)
Two of four types of navigational maps used in a hypertext system had significant effects on the number of search steps used, search efficiency, and development of cognitive maps. Cognitive style (field dependence/independence) had a significant effect on the development of cognitive maps but not on search performance.

Cline, J.A. "Cognitive Style in System Design." Master's thesis, Kent State University, 1991. (ED 343 586)
Examines how people interact with information retrieval systems in order to develop a model of a system that accommodates diverse user styles.

Eklund, J. "Cognitive Models for Structuring Hypermedia and Implications for Learning from the World Wide Web." Paper presented at AusWeb 95, First Australian World Wide Web Conference, Ballina, New South Wales, July 1995. <http://www.scu.edu.au/sponsored/ausweb/ausweb95/papers/hypertext/eklund/index.html>
Discusses cognitive models that define learning as the accumulation and organization of knowledge structures. Compares these models to the structure of hypermedia systems and addresses ways to maximize learning in hypermedia environments.

Gozzi, R., Jr. "Entertainment as/in Education." Paper presented at the 81st annual meeting of the Speech Communication Association, San Antonio, TX, November 1995. (ED 391 205)
Suggests that the new cognitive style fostered by electronic media could be called "empathy at a distance." Identifies differences between those trained in the ways and skills of print media and those more attuned to the style of electronic media.

Grabowski, B.L., and Curtis, R. "Information, Instruction and Learning." *Performance Improvement Quarterly* 4, no. 3 (1991): 2-12.
Discusses navigational, cognitive, and motivational issues related to learning with hypermedia-based information systems.

Hillinger, M.L. "Using Hypermedia to Support Understanding of Expository Text." In *Recreating the Revolution. Proceedings of the 15th Annual National Educational Computing Conference*, edited by D. Ingham. Eugene, OR: International Society for Technology in Education, 1994. (ED 396 668)
Illustrates the ways Responsive Text can enhance hypermedia to compensate for specific problems users have with decoding, comprehension monitoring, and other aspects of text.

Hsu, T.E.; Frederick, F.J.; and Chung, M.L. "Effects of Learner Cognitive Styles and Metacognitive Tools on Information Acquisition Paths and Learning in Hyperspace Environments." In *Proceedings of the 16th National Convention of the Association for Educational Communications and Technology*, edited by M.R. Simonson et al. Washington, DC: AECT, 1994. (ED 373 721)
Investigated the effects of the presence or absence of metacognitive tools on field-independent and field-dependent users of a hypermedia system.

James, W.B., and Gardner, D.L. "Learning Styles: Implications for Distance Education." *New Directions for Adult and Continuing Education* no. 67 (Fall 1995): 19-31.
Reviews types of learning styles and suggests ways to enhance distance education instructional design for different learning styes.

Kim, K.S. "Effects of Cognitive and Problem-Solving Styles on Information-Seeking Behavior in the WWW: A Case Study." *Interactive Multimedia Research Course Student Projects, University of Texas at Austin*, 1997. <http://www.edb.utexas.edu/mmresearch/Students97/Kim/index.html>
Compares performance of people with field-dependent, field-independent, and field-mixed cognitive styles and problem-focused and emotion-focused problem-solving styles in navigating the Web to find either factual or topical information.

Knupfer, N.N.; Barrett, D.; and Lee, O. "A Collaborative Multimedia Development Project for Rural Training." In *Proceedings of the 17th Annual National Convention of the Association for Educational Communications and Technology*, edited by M.R. Simonson and M.L. Anderson. Washington, DC: AECT, 1995. (ED 383 315)
Multimedia enable different paths to be followed in processing information; pathways are selected according to the skills and preferences of the user. Implications for the design of multi/hypermedia resulted from a study of social worker training via distance education.

Koenemann, J. "Dynamic Information Seeking Strategies in Electronic Worlds." Position paper for the CHI 97 Workshop on Navigation in Electronic Worlds, Atlanta, GA, March 1997. <simon.cs.vt.edu/~koeneman/CHI97_Navigation.htm>
Users adopt a range of navigational and information-seeking strategies during a single search task. Systems that focus on one uniform means (e.g., searching or browsing) may not support this behavior.

Kusrow, P.G. "From Pedagogy through Andragogy to Holosagogy." 1997. (ED 412 213)
Defines holosagogy as a new system of learning and teaching that is based on how the brain processes information and that can accommodate different learning modalities, styles, and intelligences in a culturally diverse, information-based society.

Leader, L.F., and Klein, J.D. "The Effects of Search Tool and Cognitive Style on Performance in Hypermedia Database Searches." In *Proceedings of the 16th National Convention of the Association for Educational Communications and Technology*, edited by M.R. Simonson et al. Washington, DC: AECT, 1994. (ED 373 729)
Suggests that performance differences on an information retrieval task of field-dependent and field-independent subjects using different types of hypermedia search tools (browser, index/find, map) may derive from the cognitive style differences.

Liu, M., and Reed, W. M. "The Relationship between the Learning Strategies and Learning Styles in a Hypermedia Environment." In *Proceedings of the 16th National Convention of the Association for Educational Communications and Technology*, edited by M.R. Simonson et al. Washington, DC: AECT, 1994. (ED 372 727)
Use of a hypermedia language-learning environment by nonnative speakers of English revealed differences in approach to the system by field dependent and field independent users. Ways to match hypermedia type to learning style were identified.

Melara, G. E. "Investigating Learning Styles on Different Hypertext Environments." *Journal of Educational Computing Research* 14, no. 4 (1996): 313-328.
Hypertext with network structures accommodated learning styles better than hierarchical structures. Both structures equally accommodated users who preferred observation and those who preferred experimentation.

Ogozalek, V.Z.; Bush, C.; Hayeck, E.; and Lockwood. J. "Introducing Elderly College Students to Multimedia: An Intergenerational Approach." In *Recreating the Revolution. Proceedings of the 15th Annual National Educational Computing Conference*, edited by D. Ingham. Eugene, OR: International Society for Technology in Education, 1994. (ED 396 685)
Computer science students organized a multimedia workshop to give older adult classmates hands-on experience. Design implications for older adults using computers resulted from the findings.

Small, R.V., and Ferreira, S.M. "Multimedia vs. Print Information Resources: Information Location and Use, Motivation, and Learning Patterns for Children and Adults." In *Proceedings of the 16th National Convention of the Association for Educational Communications and Technology*, edited by M.R. Simonson et al. Washington, DC: AECT, 1994. (ED 373 763)
Identified differences in engagement of text and nontext information, expectation of success, and type of knowledge representation between adults and children and between users of multimedia and print information.

Swanson, L.J. "Learning Styles: A Review of the Literature." July 1995. (ED 387 067)
Explores the various definitions of learning styles; different theories (information processing, personality, and social interaction models) and learning style research among diverse groups. Finds that learning styles may follow cultural patterns.

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